

MICHIGAN STRUCTURE INSPECTION MANUAL

BRIDGE INSPECTION

CHAPTER 10

CRITICAL FINDINGS

10.01 Purpose

The National Bridge Inspection Standards (NBIS) mandate the establishment of a statewide procedure to confirm that critical findings are resolved immediately and that actions performed to mitigate the deficiencies are recorded. These findings must be reported by MDOT to the FHWA on a quarterly basis.

A critical finding is a structural or safety related deficiency that requires immediate follow-up inspection or action (see Figure 10.01.01). MDOT's definition for a critical finding includes any instance where an entire bridge, lane, or shoulder is closed to protect public safety due to the condition of a bridge element, or damage sustained by a bridge element. Examples of critical findings include:

- Bridges with recommendations for immediate work on fracture critical bridge members;
- Bridges with recommendations for immediate correction of scour or hydraulic problems;
- Bridges with condition ratings of 2 or less for the Deck (Item 58), Superstructure (Item 59), Substructure (item 60), or Culvert (Item 62);
- Bridges with recommendations for immediate work to prevent substantial reduction in the safe load capacity.

There are safety issues that result in immediate action but do not affect the structural safety of the bridge. These types of issues will be addressed using typical emergency or high priority procedures but may not require the follow-up critical finding documentation. For example, lane or shoulder closures to repair or remove deficient appurtenances shall not be considered a critical finding. Specific examples of critical findings that may affect a bridge owner are provided in Section 10.07 to provide clarity.



Figure 10.01.01 Significant high load hit to multiple PCI beams requires bridge closure

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10.02 Documenting Critical Findings

Once a critical finding is observed it is vital to act in a prudent manner to protect public safety and infrastructure investments. The procedures herein set forth the minimum requirements expected by an inspection team leader, load rating engineer, bridge owner, and bridge program manager during critical finding observations and follow-up activities. These requirements are intended to provide bridge staff assistance as a supplement to Section 4.8.1.4 of the AASHTO *Manual for Bridge Evaluation* (MBE) and Topic 4.5 of the [FHWA Bridge Inspector's Reference Manual](#) (BIRM).

MDOT has developed the Request for Action (RFA) report to be used for addressing issues with structures which need to be scheduled for repair more urgently than the normal capital work programming process. When these issues become a safety issue immediate action should be taken. When engineering judgment dictates that immediate action is necessary to mitigate a hazard it shall be undertaken and reported in the "Immediate Action" section on the Request for Action (RFA) report. Immediate action typically requires closing the bridge, a lane or shoulder of a structure as a result of a critical finding.

Documentation of critical findings for MDOT owned bridges are required to be reported using the Request for Action report within MiBRIDGE. Failure to act and document follow up on critical findings may result in the agency being held in non-compliance and the withholding of federal transportation funding. The bridge owner or owner's representative must notify MDOT's bridge inspection program manager at MDOT-BridgeInspection@michigan.gov once an immediate action for a critical finding has been completed. MDOT Bridge Field Services staff will be responsible for contacting the FHWA Bridge Program Team Leader once notification from the MDOT or Local Agency bridge owner has been provided.

10.02.01 Entering the RFA in MiB^{RIDGE}

The RFA is used by multiple work areas and organizations to document critical findings and to resolve any action(s) that should be completed prior to the next scheduled routine inspection. For several years this process had been completed through the issuance of PDF form 1887 and 1887-LA which was made available using the MDOT Forms Repository website. Due to the extraordinary challenges of retaining the RFA records in the bridge file, prioritizing each request at multiple levels, and ensuring that any action taken is well documented an electronic system within MiB^{RIDGE} was necessary to improve efficiency and compliance. Additional enhancements for the RFA report and development of a dashboard for organizing them are scheduled for April 2015.

The primary initiators of the RFA include bridge owners and inspection team leaders that identify defects during the routine bridge safety inspection. However, other specialized groups occasionally create an RFA due to circumstances identified during an evaluation or detailed inspection. Examples of these users include load rating engineers, hydraulics engineers, design engineers, and bridge maintenance personnel. Local agency bridge owners and consultants must also utilize the RFA to

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document any immediate actions taken and are recommended to use it for other matters that require prompt resolution.

The RFA folder is located within the left Inspection Data navigation section after selecting a structure. Bridge owners are able to add an RFA for any structure in their inventory. Inspection team leaders must be assigned the routine inspection in order to create an RFA.

Once Add New is selected the RFA author may enter the observed deficiency, location, and other helpful notes in the Problems/Comments field. Additional notes may also be added to this field while the RFA is open at any time. Each comment is saved along with the user name of the author and the date. Once the RFA is saved these comments cannot be edited (see Figure 10.02.01).

STR 586 Information Summary and Current Status B01-09032

Facility: M-13 & M-84 Latitude / Longitude: 43.579867 / -83.900918 MDOT Structure ID: 09109032000B010 Structure Condition: Poor Condition(4)

Feature: E CHANNEL SAGINAW RIVER Length / Width: 508 / 45.1 Owner: MDOT Region - C and T

Location: IN BAY CITY (LAFAYETTE AV) Built / Recon. / Paint / Ovly.: 1938 / 2005 / 2005 / 2005 TSC: Bay City(4B) Operational Status: A Open, no restriction(A)

Region / County: Bay(4) / Bay(9) Material / Design: 3 Steel / 16 Movable-Bascule Last NBI Inspection: 04/17/2014 / LI71 Scour Evaluation: 3 SC - Unstable

Inventory & Appraisal Inspections / Reports Load Ratings Work Recommendations Work History Documents

Special Inspections Required: ☒ Fracture Critical (92A) ☒ Underwater (92B) ☐ Other Special (92C) ☐ Fatigue Sensitive (92D) ☒ Scour Critical

Inspection Data: (select from folders below)

Routine - BSIR
Element
Request for Action
Add New
Fracture Critical
Fatigue Sensitive
Underwater
Other Special
Damage
Scour Action Plan

REQUEST FOR ACTION 00586-10152014

Inspector Name: Andrew Bouvy Agency / Company Name: MDOT - Bridge Field Services RFA #: 00586-10152014 Insp. Date: 10/15/2014

Problems/Comments

(Identify the observed deficiency and location. Provide updated information as-needed)

IMMEDIATE ACTION (Add) Use only for Critical Findings

INTERMEDIATE ACTION REQUESTED (Add) Use for all other actions that must be taken

FINAL ACTION COMPLETED Use to document resolution

Comment

SUPPORTING IMAGES Use to add photos pertaining to the RFA

Upload images Choose File

RFA Complete ☐

Save

Figure 10.02.01 RFA Report in MiB^{RIDGE}


The Immediate Action Section is used only for Critical Findings (see Figure 10.02.02). The person who recommended the immediate action shall be identified in the Requested By field. Generally, this individual is the bridge owner or inspection team leader, but flexibility was provided so users may document the critical finding on behalf of someone else. The Completed By field is for documenting the responding individual or crew that performed the action. The Comment field allows the author to provide any additional information that clarifies the location or recommended action. For instances

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where bridge, lane, or shoulder closure is necessary and the cause is eventually mitigated the Date Traffic Restored/Signs Installed and Traffic Restoration/Sign Installation Comments field may be completed. All bridge owners are responsible for ensuring that critical findings are documented whenever a closure is necessary.


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B01-09032





Facility M-13 & M-84 Feature E CHANNEL SAGINAW RIVER Location IN BAY CITY (LAFAYETTE AV) Region / County Bay(4) / Bay(9)	Latitude / Longitude 43.579867 / -83.900918 Length / Width 508 / 45.1 Built / Recon. / Paint / Ovly. 1938 / 2005 / 2005 / 2005 Material / Design 3 Steel / 16 Movable-Bascule	MDOT Structure ID 09109032000B010 Owner MDOT Region - C and T TSC Bay City(4B) Last NBI Inspection 04/17/2014 / L17I
Structure Condition Poor Condition(4)		
Operational Status A Open, no restriction(A)		
Scour Evaluation 3 SC - Unstable		










































































































































































































































































































































































































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The Intermediate Action Section is used for non-critical actions that should be resolved prior to the next scheduled routine inspection (see Figure 10.02.03). The RFA author can provide multiple types of recommended action and assign these to specific MiB^{RIDGE} users. For example, if a damage inspection and load analysis will be required as a result of a high load impact both may be assigned immediately to each user. Additional actions may be added by the RFA author or assigned individuals at any time throughout the RFA process.

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Structure Condition Poor Condition(4)		
Operational Status A Open, no restriction(A)		Scour Evaluation 3 SC - Unstable

Inventory & Appraisal

Inspections / Reports

Load Ratings

Work Recommendations

Work History

Documents

Special Inspections Required:
☒ Fracture Critical (92A)
 ☒ Underwater (92B)
 ☐ Other Special (92C)
 ☐ Fatigue Sensitive (92D)
 ☒ Scour Critical

Inspection Data: (select from folders below)

- Routine - BSIR
- Element
- Request for Action

Add New
- Fracture Critical
- Fatigue Sensitive
- Underwater
- Other Special
- Damage
- Scour Action Plan

INTERMEDIATE ACTION REQUESTED [Add](#)

Request For	Contact/User	Reviewed	Review Date	Priority Level	Completed	Complete Date
Damage Inspection	Christopher Idusuyi	<input type="checkbox"/>			<input type="checkbox"/>	
Comments						
<input type="button" value="remove"/>						

Request For	Contact/User	Reviewed	Review Date	Priority Level	Completed	Complete Date
Load Rating	MDOT Load Rating	<input type="checkbox"/>			<input type="checkbox"/>	
Comments						
<input type="button" value="remove"/>						

FINAL ACTION COMPLETED

Comment

RFA Complete
☐


Figure 10.02.03 Intermediate Action Section Used for Noncritical Issues


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Each user then has the ability to review the RFA, provide the date that the review occurred, set a priority level, and add comments as-needed (see Figure 10.02.04). Additional information regarding priority levels will be provided through the issuance of a bridge advisory in the near future. Until the requested action is marked complete by the user automated monthly email notifications of the outstanding RFA and the ability to add comments will be provided.

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		Structure Condition Poor Condition(4) 
		Operational Status A Open, no restriction(A) Scour Evaluation 3 SC - Unstable

[Inventory & Appraisal](#)

[Inspections / Reports](#)

[Load Ratings](#)

[Work Recommendations](#)

[Work History](#)

[Documents](#)

Special Inspections Required:
☒ Fracture Critical (92A)
 ☒ Underwater (92B)
 ☐ Other Special (92C)
 ☐ Fatigue Sensitive (92D)
 ☒ Scour Critical

Inspection Data: (select from folders below)

[Print](#)
[Print All](#)

- Routine - BSIR
- Element
- Request for Action
 - [Add New](#)
- Fracture Critical
- Fatigue Sensitive
- Underwater
- Other Special
- Damage
- Scour Action Plan

INTERMEDIATE ACTION REQUESTED [Add](#)

Request For	Contact/User	Reviewed	Review Date	Priority Level	Completed	Complete Date
Damage Inspection	Christopher Idusuyi	<input type="checkbox"/>			<input type="checkbox"/>	
<div style="background-color: #d9ead3; padding: 5px; border: 1px solid #ccc;"> Comments </div> <div style="border: 1px solid #ccc; height: 40px; margin-top: 5px;"></div> <div style="text-align: right; margin-top: 5px;"> remove </div>						
Load Rating	MDOT Load Rating	<input type="checkbox"/>			<input type="checkbox"/>	
<div style="background-color: #d9ead3; padding: 5px; border: 1px solid #ccc;"> Comments </div> <div style="border: 1px solid #ccc; height: 40px; margin-top: 5px;"></div> <div style="text-align: right; margin-top: 5px;"> remove </div>						

FINAL ACTION COMPLETED

RFA Complete
☐


Figure 10.02.04 Intermediate Action Assignments Should be Completed by Each Assigned User

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The Final Action Completed section allows the bridge owner to summarize resolution of the RFA and mark it complete (see Figure 10.02.05). For example, if increased monitoring will be performed the bridge owner should provide a comment that a special inspection has been scheduled. Only bridge owners and select users have access rights to mark the RFA complete.

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Structure Condition Poor Condition(4)		
Operational Status A Open, no restriction(A)		
Scour Evaluation 3 SC - Unstable		

Inventory & Appraisal
Inspections / Reports
Load Ratings
Work Recommendations
Work History
Documents

Special Inspections Required:

☒ Fracture Critical (92A)
 ☒ Underwater (92B)
 ☐ Other Special (92C)
 ☐ Fatigue Sensitive (92D)
 ☒ Scour Critical

Inspection Data: (select from folders below)

- Routine - BSIR
- Element
- Request for Action
 - [Add New](#)
- Fracture Critical
- Fatigue Sensitive
- Underwater
- Other Special
- Damage
- Scour Action Plan

remove

Request For	Contact/User	Reviewed	Review Date	Priority Level	Completed	Complete Date
Load Rating	MDOT Load Rating	<input type="checkbox"/>			<input type="checkbox"/>	

remove

FINAL ACTION COMPLETED

Comment

RFA Complete

☐

SUPPORTING IMAGES

Upload images
Choose Fi



Save

Figure 10.02.05 Final Actions Should be Completed by the Bridge Owner

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The ability to add photographs is another unique feature that will improve the review process and reduce digital storage needs as the distribution of emails to multiple personnel will no longer be required. Over time this will lead to a substantial reduction in operating costs and provide a history of bridge component or element deterioration as the ability is applied to other types of inspection reports. At any time during the RFA process a user may upload images and provide a description of the photograph (see Figure 10.02.06).

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	Facility M-13 & M-84	Latitude / Longitude 43.579867 / -83.900918	MDOT Structure ID 09109032000B010	Structure Condition Poor Condition(4)		
	Feature E CHANNEL SAGINAW RIVER	Length / Width 508 / 45.1	Owner MDOT Region - C and T	Operational Status A Open, no restriction(A)		
	Location IN BAY CITY (LAFAYETTE AV	Built / Recon. / Paint / Ovly. 1938 / 2005 / 2005 / 2005	TSC Bay City(4B)	Scour Evaluation 3 SC - Unstable		
	Region / County Bay(4) / Bay(9)	Material / Design 3 Steel / 16 Movable-Bascule	Last NBI Inspection 04/17/2014 / LI71			




Inventory & Appraisal	Inspections / Reports	Load Ratings	Work Recommendations	Work History	Documents
Special Inspections Required: <input checked="" type="checkbox"/> Fracture Critical (92A) <input checked="" type="checkbox"/> Underwater (92B) <input type="checkbox"/> Other Special (92C) <input type="checkbox"/> Fatigue Sensitive (92D) <input checked="" type="checkbox"/> Scour Critical					
Inspection Data: (select from folders below) <div style="float: right;"> <input type="button" value="Print"/> <input type="button" value="Print All"/> </div>					
<ul style="list-style-type: none"> [-] Routine - BSIR [-] Element [-] Request for Action <ul style="list-style-type: none"> Add New [-] Fracture Critical [-] Fatigue Sensitive [-] Underwater [-] Other Special [-] Damage [-] Scour Action Plan 	<div style="border: 1px solid #ccc; padding: 5px;"> SUPPORTING IMAGES Upload images <div style="text-align: right; margin-top: 5px;"> <input type="button" value="Choose File"/> </div> <div style="margin-top: 10px;"> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px; border: 1px solid #ccc; padding: 5px; flex-grow: 1;"> (Photo description) </div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <div style="margin-top: 5px;"> <input type="button" value="remove"/> </div> </div> <div style="margin-left: 10px; border: 1px solid #ccc; padding: 5px; flex-grow: 1;"> (Photo description) </div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="text-align: center;">  <div style="margin-top: 5px;"> <input type="button" value="remove"/> </div> </div> <div style="margin-left: 10px; border: 1px solid #ccc; padding: 5px; flex-grow: 1;"> (Photo description) </div> </div> </div> </div>				

Figure 10.02.06 Photos May Be Added to the RFA for Documenting Findings

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Users who have been assigned an intermediate action can access them from the My Assignments tab. Upon clicking on the number of Requests for Action a list of the associated bridges is provided (see Figure 10.02.07)

The screenshot shows the MiBRIDGE Bridge Management and Inspection System interface. The left sidebar has the 'My Assignments' tab highlighted. The top navigation bar displays 'Requests for Action' with a total of 1, which is circled in red. Below this, the 'All Assigned Inspections' table lists one bridge with a critical finding.

Select	Struct. Nbr.	Bridge ID	Facility Carried	Features Intersected	Owner	Routine	Fracture Critical	Fatigue Sensitive	Underwater	Other Special	Earliest Assigned Insp. ▲
<input type="checkbox"/>	4723	41141025000B013	I-96 EB	GRAND RIVER	Grand						

Figure 10.02.07 Users Assigned an Intermediate Action May Access the RFA through the My Assignments Tab

10.03 Critical Finding Procedures – Inspection Team Leader Responsibilities

The inspection team leader is responsible for planning, preparing, and performing scheduled field inspections. In the event that a critical finding is observed by the inspection team it is the team leader's responsibility for initiating the necessary procedures to protect the public (see Figure 10.03.01). The team leader shall immediately notify the bridge owner or acting responsible authority verbally of any critical finding that is discovered during an inspection. If the extent of the critical finding presents an immediate danger to public safety it is the responsibility of the team leader to notify law enforcement.

The critical finding shall be documented by entering all known information on the RFA report. At a minimum, the team leader shall enter data into the fields in the Problems/Comments Explanation and Immediate Action section. The team leader must email the form within 24 hours to the bridge owner. The MDOT [Transportation Service Center \(TSC\) manager](#) shall be contacted for all local agency critical findings. The team leader is also responsible for documenting the critical finding on the inspection report.

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Figure 10.03.01 Full depth hole observed during a routine inspection

10.04 Critical Finding Procedures – Load Rating Engineer Responsibilities

The load rating engineer is responsible for determining the safe load carrying capacity of a bridge using plans and supplemental information gathered from previous field inspections. The load rating engineer shall immediately notify the bridge owner when it is discovered that a bridge cannot carry all Michigan legal loads at the operating level (see Figure 10.04.01).

When the load rating is in response to an RFA, the load rating engineer may provide several recommendations for the bridge owner to consider. These options provided by the load rating engineer, along with other substantial actions taken to facilitate the load rating, must be documented in the Summary of Intermediate/Final Actions section of the form.

The Immediate Action section of the RFA report shall be completed by the load rating engineer in instances where there is a recommendation for immediate work to prevent substantial reduction in safe load capacity, or when the rating level is less than the current load posting. A substantial reduction in safe load capacity is defined as a decrease of 20% or more of the previously calculated rating. When the recommended reduction is less than substantial an RFA may be submitted to the bridge owner but does not have to be reported to Bridge Field Services. These occurrences will be identified and reported to the FHWA through an automated query in the MiB^{RIDGE} application. For MDOT owned bridges, the recommended postings from Form 0231 shall be included or referenced on the RFA.

The load rating engineer shall email the form within 24 hours to the bridge owner. The MDOT [Transportation Service Center \(TSC\) manager](#) shall be contacted for local agency critical findings.

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Figure 10.04.01 Severe loss of section resulting in a safe load capacity of 3 tons

10.05 Critical Finding Procedures – Bridge Owner Responsibilities

The bridge owner must ensure that all of the processes to mitigate the deficiency are fulfilled and the critical finding is reported. The bridge owner shall immediately respond to notification of a critical finding and review the information provided by the team leader, load rating engineer, or other concerned individual. The bridge owner is required to ultimately determine if a safety hazard exists and what immediate action should be completed. Options to consider include bridge closure, lane closure(s), shoulder closure, or a process of increased monitoring.

The bridge owner or owner's representative must email the RFA form to MDOT's bridge inspection program manager at MDOT-BridgeInspection@michigan.gov within 72 hours of completing an immediate action for a critical finding. Although the bridge may require repair or replacement the critical finding is considered addressed once the immediate safety hazard has been resolved. However, the RFA form must continue to be used to record the intermediate and final actions undertaken.

10.05.01 Critical Finding Procedures – Bridge Owner Responsibilities (MDOT Owned Bridges)

The bridge owner for MDOT owned bridges is the Region Bridge Engineer or Central Office Bridge Engineer that has been delegated the inspection responsibilities outlined in NBIS. In the event of a critical finding the engineer tasked for ensuring NBIS compliance will contact the TSC manager or region operations engineer to request any necessary traffic control measures, updates to the Lane Closure and Reporting System (LCAR), and media releases.

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10.05.02 Critical Finding Procedures – Bridge Owner Responsibilities (Local Agency Owned Bridges)

The bridge owner for local agencies and other organizations is the local government unit or designated institution that has been delegated the inspection responsibilities outlined in NBIS. The bridge owner shall ensure that all of the processes to mitigate the deficiency are fulfilled and the critical finding is reported.

10.05.03 Critical Finding Procedures – Bridge Owner SI&A Coding Responsibilities

It is the responsibility of each bridge owner to verify that the [Structure Inventory and Appraisal \(SI&A\)](#) data for each bridge is accurate after immediate and final actions have been completed to address a critical finding. Once an entire bridge, lane(s), or shoulder has been closed, or other actions have been taken to eliminate the hazard at least one of the following items must have coding adjusted:

- Item 41 – Structure Open, Posted, or Closed to Traffic
- Item 58 – Deck
- Item 59 – Superstructure
- Item 60 – Substructure
- Item 61 – Channel & Channel Protection
- Item 62 – Culverts
- Item 70 – Bridge Posting
- Item 91 – Designated Inspection Frequency
- Item 103 – Temporary Conditions

If the structure is closed, a load posting is recommended, the bridge is posted, temporary supports are installed, or any other critical finding occurs then Item 41 should be coded “B”, “D”, “E”, “K”, “P”, or “R” (see Figure 10.05.01). If the item is coded “K” at least one of Items 59, 60, 62, or 67 should be coded a “0” or “1”. When the bridge requires posting, Item 70 should be coded “4” or less according to Item 64M.

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Figure 10.05.01 Item 41 should be coded “D” due to installation of engineered temporary supports

Natural deterioration that leads to an NBI rating of “2” for the Items 58, 59, 60, or 62 that were previously rated poor do not require an RFA form to be submitted to the bridge program manager. Although the rating is a critical finding the data may be reported to the FHWA through an automated query in the MiB^{RIDGE} application. However, if a component was previously rated in good/fair condition and the new rating results in a critical/imminent failure condition the RFA process must be completed. This is considered a critical finding and the immediate action must be documented.

Item 91 may also be adjusted for a reduced inspection frequency in the event of a bridge posting, temporary support installation, scour observation, emergency repair activities, or any other critical finding. The maximum recommended intervals between inspections should be scheduled according to Bridge Advisory MDOT [Guidelines for Bridge Inspection Frequencies](#).

Within 30 days of corrective actions that are taken to resolve a critical finding the bridge owner shall schedule an inspection. If possible, the team leader responsible for submitting the RFA should perform the inspection and update the bridge safety inspection report. The SI&A coding may not be altered to reflect any improvements made until a follow-up inspection has been completed. For example, coding of Item 41 may not be changed to “P” without a follow-up documented inspection.

10.06 Bridge Program Manager Responsibilities

The bridge program manager is responsible for developing policies and procedures to ensure that critical findings are addressed timely. This includes verification that statewide critical finding data is recorded into the database for quarterly distribution to FHWA. The bridge program manager shall assist the bridge owner as-needed throughout the entire RFA process. The bridge program manager may

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perform a quality assurance review and analyze the decisions and activities that were incorporated to resolve a critical finding to verify compliance with the NBIS.

10.07 FHWA Notification of Critical Findings

Directly after an immediate action is performed and public safety is no longer threatened, the bridge owner is responsible for notifying Bridge Field Services by phone or email regarding the event. Pertinent information for notification should include the structure number, location, explanation of the problem, and action(s) taken. Bridge Field Services staff will be responsible for contacting the FHWA Bridge Program Team Leader once notification from the MDOT or Local Agency bridge owner has been provided. In the event that action is taken to mitigate the damage, deterioration, or other factors that led to the closure the bridge owner provide a supplemental update. Information pertaining to critical findings may be emailed to MDOT-BridgeInspection@michigan.gov or by calling:

Richard Kathrens
Bridge Inspection Program Manager
Cell: (517) 749-4274

Andrew Bouvy
Bridge Inspection Engineer
Cell: (517) 242-1164

10.08 Critical Finding Examples

Although the circumstances for each critical finding are often unique, the process for resolving each of them is similar. Examples that affect each bridge owner may include:

- Shoulder closure on bridge due to high load impact to fascia beam;
- Lane closure on redundant bridge due to deep spall under bearing;
- Bridge closure due to pressure flow or because of severe scour and undermining;
- Load rating or missing load posting sign

The team leader's actions are especially important during fracture critical member (FCM) inspections. FCM inspection is one of the most important processes to ensure a safe and functional transportation system in Michigan. Failure of a FCM may suddenly lead to the collapse of an entire span or bridge and result in loss of life. Any FCM with the following characteristics is a critical finding and may require closure of the bridge and repairs prior to reopening:

- Pack rust leading to substantial deformation of gusset plates or other built up members
- Impact damage that has deformed the member
- Perpendicular or parallel stress cracking
- Severe section loss of primary members
- Distortion of elements due to fatigue

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For additional information see [Chapter 7](#) for fracture critical inspection procedures.

During a flood event the bridge owner or team leader must refer to the scour plan of action that has been developed for all scour critical bridges. The scour action plan provides personnel responding to a suspected scour event with a monitoring plan that includes a summary of scour calculations performed by the hydraulics engineer, information regarding the foundation and soil types, items to watch, conditions to evaluate bridge closure, and contacts to initiate the process.

The examples provided below are to assist bridge staff with the procedures outlined. They may be modified according to each bridge owner's policies and the specific circumstances involved with a critical finding.

10.08.01 Critical Finding Examples - Damage Inspection

Damage inspections are not scheduled and typically initiated by a report from local law enforcement or a concerned citizen. The bridge owner is usually the first to be informed and often responds directly. However, the duty of responding to the incident may be delegated by the bridge owner to the team leader.

The most common damage inspections performed in Michigan are a result of a truck transporting cargo that exceeds the vertical clearance of a bridge commonly referred to as a high load hit (HLH). Other examples include impacts to bridge elements from ships, fire damage, buckled beams from corrosion, lateral torsional buckling due to pin and hanger freeze, and loss of engineered fill due to missing joint seals near the abutment and approach slab interface. Although action is required by the bridge owner to verify the extent of damage a critical finding may not exist if there are no safety concerns following the inspection. Once the bridge owner or team leader responds to the incident and determines that a safety concern exists a phone call is made to one or all of the following; law enforcement, the bridge owner if they are not present, and/or maintenance staff to assist with closing the affected lanes or shoulder.

MICHIGAN STRUCTURE INSPECTION MANUAL

BRIDGE INSPECTION – CRITICAL FINDINGS

Example #1 – MDOT Owned Bridge Damage Inspection



Figure 10.08.01 Crack in fascia beam as a result of a HLH impact

- 11:15 a.m. – The team leader arrives to the bridge of a reported HLH and immediately notices a crack and that the east portion of the fascia beam has dropped approximately 2 inches. In addition, the inspector observes that all but one of the stitch welds connecting the beam to the interior diaphragms appears to be cracked (see Figure 10.08.01).
- 11:17 a.m. – The team leader calls 911, identifies himself, and informs the operator that a truck has hit the Carpenter Road bridge over I-75 causing severe damage to a beam requiring the bridge and two northbound I-75 lanes to be closed.
- 11:19 a.m. – The team leader contacts the region bridge engineer and informs him that the fascia beam is unstable and 911 has been contacted.
- 11:22 a.m. – The region bridge engineer contacts the region maintenance crew supervisor and directs the maintenance crew to begin placing signs for double freeway lane closure and barricades to close the bridge.
- 11:27 a.m. – Police arrive and close the lanes until the maintenance crew arrives.
- 11:43 a.m. – The region bridge engineer arrives and inspects the damage. The statewide emergency coordination engineer and Statewide Signs supervisor are notified.
- 1:05 p.m. – The Statewide Signs crew arrives and begins to remove the sign fastened to the fascia. The emergency coordination engineer inspects the damage and contacts the Statewide Bridge Crew for repair.
- 3:15 p.m. to 4:45 a.m. – The Statewide Bridge Crew temporarily supports the fascia beam, performs heat straightening, and installs a bolted repair. Northbound I-75 is reopened while the eastbound lane on the bridge remains closed.

MICHIGAN STRUCTURE INSPECTION MANUAL

BRIDGE INSPECTION – CRITICAL FINDINGS

The critical finding RFA must be submitted to the bridge owner within 24 hours, and on the very next day it is provided to the bridge owner and TSC manager. Once the bridge and lanes were closed the critical finding is considered complete. However, the bridge owner is required to submit the RFA to the bridge program manager within 72 hours. The bridge owner is responsible for adding any missing information and emailing the form (See Figure 10.08).

Example #2 – Local Agency Owned Bridge Damage Inspection



Figure 10.08.02 Bridge posting sign is illegible.

- 1:35 p.m. – A farmer contacts the local county road commission office to inquire about the safe load carrying capacity of a bridge because the posting sign cannot be read.
- 2:17 p.m. – The county road commission engineer visits the bridge and inspects the damaged sign (see Figure 10.08.02). The engineer contacts the county maintenance facility for a replacement sign.
- 2:36 p.m. – No signs are available, and the engineer instructs the maintenance crew to close the bridge.
- 3:58 p.m. – The bridge is closed until the sign is replaced.

During the very next day the county road commission engineer submits form 1887-LA to the bridge program manager. The engineer also contacts the bridge program manager for a sign because the vendor they often utilize states that it may take up to four weeks for a new sign. The bridge program manager requests a sign from the Statewide Signs unit and a new one is installed 3 days later allowing the bridge to be reopened. The bridge owner then updates the Summary of Intermediate/Final Actions field of the RFA to document the installation.

MICHIGAN STRUCTURE INSPECTION MANUAL

BRIDGE INSPECTION – CRITICAL FINDINGS

10.08.02 Critical Finding Examples – Scheduled Bridge Safety Inspection

The team leader is responsible for initiating a response when a critical finding is identified during a routine bridge safety inspection. Often times, while inspecting a bridge that is load path redundant, a shoulder or lane closure may suffice to protect public safety.

Example #1 – MDOT Owned Bridge Routine Inspection

- 8:15 a.m. - The bridge inspection team is performing a routine inspection and they notice an abutment spall beneath the fascia beam on a redundant load path structure (see Figure 10.08.03).
- 8:25 a.m. - The team leader contacts the region bridge engineer and requests maintenance forces to close the shoulder of the bridge until repairs may be completed.
- 8:33 a.m. – The region bridge engineer contacts the maintenance supervisor and requests a shoulder closure.
- 10:17 a.m. - The shoulder closure is installed and the critical finding is considered complete.
- 3:30 p.m. - The inspector notes the deficiency under SI&A Item 60 on the bridge safety inspection report and submits an RFA to the region bridge owner.
- 4:25 p.m. – The RFA is submitted to the bridge program manager for FHWA reporting, the region maintenance crew requesting excavation in preparation of temporary supports, and the statewide emergency coordination engineer requesting temporary supports.



Figure 10.08.03 Abutment spall under fascia beam initiates shoulder closure

Example #2 – Local Agency Owned Bridge Routine Inspection

- 2:15 p.m. – A prequalified bridge inspection consultant notices that three adjacent rolled steel beams resting on top of a pier have severe loss of section and are buckling. The consultant contacts the City Manager's office and recommends closing a lane above until further observations and repairs may be made.
- 2:37 p.m. – Two Department of Public Works employees respond and close the lane.

MICHIGAN STRUCTURE INSPECTION MANUAL

BRIDGE INSPECTION – CRITICAL FINDINGS

- 4:05 p.m. – The consultant team leader submits an RFA to the city manager regarding the critical finding and requests permission to perform a detailed inspection.
- The Bridge Owner verifies that the lane has been closed makes sure the RFA documentation is complete.
- 5:58 p.m. – The City Manager submits the form to the bridge program manager with the TSC manager carbon copied, codes Item 91 “3”, and sends an email to the consultant requesting a cost estimate for an in-depth inspection.

10.09 Completing the RFA Process

Although the RFA form must be submitted for all critical findings, they are also required to be issued anytime an activity is required prior to the next routine inspection. For observations or deficiencies that are not critical, the fields provided in the immediate action section should be left blank. The bridge inspector or bridge owner may initiate an RFA for non-critical work and decide which intermediate actions are required. The recommendations provided determine the final action that is to be requested. Each RFA must have information entered into the summary of intermediate and final actions to allow the bridge program manager to review the decisions deliberated upon during a quality assurance review. Once the issue that initiated the RFA is resolved, or a process such as monitoring is recommended until the condition changes, the bridge owner shall document the completion of the RFA in the Summary of Intermediate / Final Actions field.